



Management and phenotypic characterization of donkeys of Rajasthan

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ABSTRACT

The donkey, a very important draught animal of Rajasthan, is mostly used by nomadic pastoralists in brick kilns for carrying bricks and in pneumatic wheel cart for rural and urban transport. The study was conducted to know the socio-economic role in the life of donkey keepers of the region, housing, feed and fodder, health management of donkeys adopted by them and to phenotypically characterize local donkeys available in different regions of Rajasthan. Small sized light and dark gray donkeys of Rajasthan play important role in providing draught power in pastoral migration and other draught operations. The donkeys are very hardy and surefooted. Zebra marking on legs and dorsal stripes on back could be seen. Donkeys are of many coat colours but light and dark gray is more prevalent, accompanied by shoulder crosses, dark ear markings, white muzzles, eye rings, white bellies and inner legs. In adult donkeys, body length was almost equal to height and width. Mean body length, height at withers, heart girth, knee height and height at hock of adult donkeys were 97.57 ± 0.579 , 97.55 ± 0.584 , 101.74 ± 0.670 , 31.64 ± 0.275 , 40.14 ± 0.281 , respectively. Hooves of donkeys are small and round with upright pasterns. Donkey owners were offering soya straw, gram straw, groundnut straw, rice straw, *moth* straw and *dhanja jiri* as dry roughage. Vaccination, insurance and use of disinfectants were not adopted by any of the donkey owner. The donkey works hard for a long time but its role is not appreciated. Donkeys are the major source of livelihood of the donkey keepers studied. Majority of the owners were not aware about the symptoms of estrus jenny and their jennies were getting pregnant through the natural covering during grazing.

Key words: Phenotypic Characterization, Biometric, Donkeys, Management, Rajasthan

During the last 2 livestock census (2003, 2007), a sharp decrease in equine population from 1.56 million to 1.18 million was recorded in India due to their decreased demand, indiscriminate and un-systematic breeding, poor health and managerial practices etc. Donkey population in particular, decreased from 0.65 to 0.44 million between last 2 census (<http://dahd.nic.in/dahd/statistics/animal-husbandry-statistics.aspx>). But, about 0.10 million donkeys are available in Rajasthan. Donkeys are known as the beast of burden. These are unclassified and recognized as local and non-descript donkeys. These animals have very good draught-power, immunity and stress bearing capabilities (Rattan *et al.* 1998, Gupta *et al.* 2000). These animals are the only source of livelihood for a particular section of the society which includes poorest of poor countrymen (nomadic tribes etc). In Rajasthan, donkeys are used mainly as pack animals while in Sardarsahar, Churu, Rajgarh, Sikar, Ratangarh, Jhunjhunu

these are mainly used in carting. These are capable of thriving in hot climate (Pal *et al.* 1998, Pal *et al.* 2000) and can survive even in adverse conditions such as scarcity of feed (Gupta *et al.* 1999, Pal and Gupta 2004, Pal and Gupta 2004a). These animals are indiscriminately used by their owners for carrying heavy loads through pneumatic carts both on coal tar roads and sandy routes without much attention towards their health and feeding aspects. A need was felt for their systematic and scientific evaluation including generation of base line data on physical and phenotypic characteristics, feeding, housing and health management, socio-economic impact analysis and reproductive efficiency so that efforts may be made for registration of these area specific donkeys.

MATERIALS AND METHODS

Donkeys available in different areas including Churu, Rajgarh, Ratangarh, Sardarsahar, Bikaner, Sikar, Jhalawar, Baran, Kota as well as those assembled during health camps and equine fairs were included in this study. Information on the performance traits and various management practices followed by donkey owners were collected by personal interview using a structured questionnaire. The physical

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characteristics and coat colours were recorded from 155 donkeys. Feeding, housing and management practices adopted by donkey owners were recorded from 66 donkey owners of Jhalawar, Baran and Kota (South Eastern Rajasthan) and 50 donkey keepers of Sardarsahar, Churu, Rajgarh, Sikar, Hanumangarh and Ratangarh (North Eastern Rajasthan).

For biometric indices, 74 adult male donkeys and 23 donkeys below 3 years of age were used for generating base line information for phenotypic characterization. Average age of male adult donkeys was 5.76 ± 2.12 years. Fifteen different biometric indices were recorded for phenotypic characterization of the breed viz. height at wither (HW), body length (BL), heart girth (HG), face length (FL) and width (FW), ear length (EL) and width (EW), hoof length (HoL) and width (HoW), fore (FLL) and hind (HLL) leg lengths, height at knee (HK) and hock (HH), canon and pole were recorded. Data on different body measurements was statistically analyzed using SPSS 7.1 software.

Physical characteristics and coat colours were expressed in percentage/frequency. A donkey's economic importance and socio-cultural role was discussed with the donkey owners. This study is based on the information given by the donkey owners, and managerial practices were documented along with phenotypic characteristics.

RESULTS AND DISCUSSIONS

Donkey population: In different districts of Rajasthan 1,02,130 donkeys are available (Fig. 1). Maximum donkey population is in Barmer district followed by Jaisalmer, Bikaner, Churu and least in Tonk district (http://animalhusbandry.rajasthan.gov.in/livestock_census.aspx). These animals are used for carrying different types of load by their owners for earning their livelihood while 5–10%

donkeys are also used by shepherds/nomadic tribes for carrying their children, old family members and house-hold belongings from one place to other with their animal herds.

Physical characteristics: The small light and dark gray donkeys are prevalent throughout the Rajasthan as well as in other states like Haryana, Punjab and Uttar Pradesh. These donkeys are very hardy and surefooted. Their body is well developed with fairly strong bones. The mane is short and stands straight up; they usually have a dorsal stripe (a stripe along their back) and a stripe along the shoulders. They have very dominant eyebrow ridges and can be very stubborn. Lips are loose compared to horses. The legs are thin and covered with small coarse hairs. Zebra marking on legs and stripe on back was also seen. The body is solid, displaying an alert attitude, the face is convex, the ears of donkey are much longer than horses' erect and, the eyes are black. The back is straight/sloppy and the tail is medium in length, thin with tasseled end and straight. Neck is short. Donkeys are well adapted to the ecology of the area. They are docile in temperament. It is used to carry 24–30 bricks (60 to 75 kg) on its back in the plains and to pull 400–600 kg of load in cart. Age at first mating is 2–4 years depending upon feed availability and type of work.

Body colour: Donkeys are having light gray, white and dark gray coat colour accompanied by dorsal stripes on the back, spots, dark ear markings, white muzzles, eye rings, white bellies and inner legs. The body colour pattern studied on donkeys revealed that light gray and dark gray (70%) and white (30%) are the common colours.

Body measurements

Fifteen different biometric indices of 97 local non-descript donkeys (23 young and 74 adult) were recorded for generating base line information for phenotypic characterization (Tables 1, 2).

Young stock: Average values for different biometric indices namely, body length, height at withers, heart girth, fore leg length, knee height, canon length, hind leg length, height at hock, ear length, ear width, face length, face width, pole, hoof length and width in young donkeys (23) are given in Table 1.

Adult: For adult donkeys (74), average values of body length, height at withers, heart girth, fore leg length, knee height, canon length, hind leg length, height at hock, ear length, ear width, face length, face width, pole, hoof length and width are given in Table 2. In all these adult donkeys, body length was almost equal to height at withers. Average age of donkeys was 5.76 ± 2.12 years. Height at withers reported in the present study is slightly more than that reported by Singh *et al.* (2007). This base line information will be quite useful in registration of these donkeys as a separate breed.

Feeding management: The donkey consumes all types of grasses and bushes, but prefers to graze on *dub* (*Cynodon*

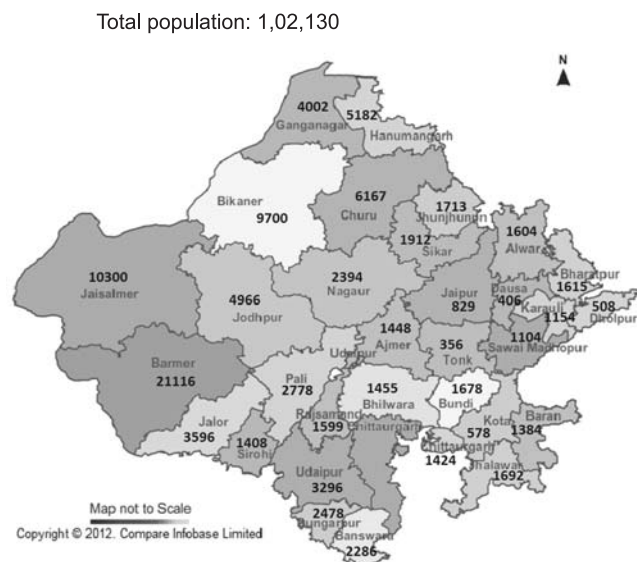


Fig. 1. Donkey population in different district of Rajasthan.

Table 2. Different biometric indices of 74 adult donkeys selected from different areas of Rajasthan (cm)

No.	BL	HW	HG	FLL	HK	Can	HL	HH	EL	EW	FL	FW	P	Ho L	Ho W
Av	97.57	97.55	101.74	66.97	31.64	17.99	72.15	40.14	21.83	18.28	47.33	14.8	10.25	6.24	6.51
Range	87–108	88–109	91–120	60–76	26–40	14–22	53–84	33–49	18–26	16–21	40–58	13–18	13–Sep	8–May	9–May
SEM	0.825	0.631	0.957	0.541	0.349	0.355	0.579	0.426	0.226	0.245	0.394	0.218	0.171	0.159	0.087

Table 1. Biometric indices of young donkeys selected from different areas of Rajasthan (cm)

No.	BL	HW	HG	FLL	HK	Can	HL	HH	EL	EW	FL	FW	P	Ho L	Ho W
Mean	92.59	93.87	96.98	65.3	31.18	17.7	70.32	38.36	21.89	18.02	45.73	13.89	9.75	5.57	6.05
Range	84.00– 104.00	87.00– 160.00	86.00– 106.00	61.00– 70.00	28.00– 39.00	16.00– 22.00	64.00– 75.00	30.00– 44.00	19.00– 25.00	16.00– 21.00	43– 51.00	10.00– 19.00	9.00– 11.00	4.50– 7.00	5.50– 7.00
SEM	1.493	1.142	1.731	0.978	0.632	0.642	1.048	0.771	0.409	0.443	0.712	0.394	0.309	0.352	0.151

dactylon) grass. Mean herd size per donkey owner was 5.29 ± 0.50 (range 1 to 25) and 1.22 ± 0.06 (range 1–2) donkey in SE Rajasthan and NE Rajasthan, respectively. Donkey keepers of NE Rajasthan were maintaining less number of donkeys and were using them in carting operation whereas in SE Rajasthan, donkeys were maintained for carrying pack loads. Majority of donkey owners of SE Rajasthan were maintaining their donkeys on soya (*Glycine max*) straw being the main crop of that region, while others were providing gram straw, groundnut (*Arachis hypogaea*) straw and *dhanija jiri* (*Coriandrum sativum*). Majority of donkey owners of NE Rajasthan were maintaining their donkeys on *moth* (*Vigna aconitifolia*) straw being the main crop of that region, while others were providing gram (*Macrotyloma uniflorum*) straw, groundnut straw and wheat straw. In both the regions, donkeys were offered leguminous forages which are rich source of protein than grasses and straws for daily wear and tear loss (Aganga *et al.* 2000). Donkeys are left for grazing after work and stall fed during night in SE Rajasthan whereas in NE Rajasthan, donkeys are mostly stall fed. The average dry roughages provided to each donkey were 4.697 ± 0.053 (range 3 to 5 kg) and 4.140 ± 0.100 kg (range 3 to 5 kg) SE and NE Rajasthan, respectively. In SE Rajasthan, majority of donkey owners (74%) did not offer green fodder to their donkeys but let them loose for grazing after work whereas some owners provided 1–4 kg green fodder daily in SE Rajasthan. In NE Rajasthan, 64% respondents were offering locally available green fodder (2.750 ± 0.190 kg/day/animal). Only 39.4% of the owners provided concentrate (rice bran, wheat bran and gram) to their donkeys in SE Rajasthan. Majority of the respondents of SE Rajasthan were not providing concentrate to the donkeys. However, donkeys used for heavy work were offered 684 ± 213 g concentrate comprising rice husk, *kala matar* (*Pisum sativum*), barley (*Hordeum vulgare*), *bajra* (Pearl millets) and gram during stall-feeding per donkey per day. Aganga *et al.* (2000) reported that donkeys seldom need any additional feed as free-range animals. All the owners of NE Rajasthan were

providing concentrate (1.100 ± 0.490 kg) to their donkeys comprising *moth* (*Vigna aconitifolia*), *bajra* (Pearl millets) and gram (*Macrotyloma uniflorum*). Ahmed *et al.* (2008) also reported that donkeys in Nigeria were maintained with little or no feed supplementation in the form of straw, house hold waste or grains. Geggry (*gur*) was provided regularly to their donkeys by 51.52% and 48% of the respondents of SE and NE Rajasthan, respectively. Mean quantity of *gur* offered to each donkey was 111.46 ± 10.52 g (range 100–250g) and 258.33 ± 2.39 g (range 150–500g)/day, in SE and NE Rajasthan, respectively. Concentrate feeding and feed supplementation in the form of *gur* is offered more in NE Rajasthan to meet the energy requirements as the donkeys of this region pull heavy loads in carts. Most of the equine owners were supplying common salt to donkeys but no mineral mixture was provided in both the regions. Generally, there is great loss of salt and minerals through sweat in working donkeys therefore working donkeys should be offered with mineral mixture and common salt to replenish the sweat loss of minerals and sodium. Donkey keepers provide water twice a day during winter and 3–4 times during summer and adopt natural breeding methods.

Housing management: In Rajasthan, donkeys generally are not kept in proper houses. Only 19.70% donkey owners of SE and 8% of NE Rajasthan, who are economically sound provide *pucca* house for their donkeys otherwise donkeys were housed in *kutch* or *thatch* houses. Singh *et al.* (2007) also reported that about 80% donkeys were kept in groups in an open *bara* (wooden enclosure) without roof and proper gate. Pal and Legha (2008) also observed that 44% of mule producers of Haryana, Utrakhand and UP provide *kutch* thatch shed to their equines. Equines are very sensitive animals; benefits of rearing of equines on *kutch* floor are well established. *Pucca* floor is a major cause of laminitis in equines. Majority of the equine owners (80.30%) use equine dung for composting by mixing it with dung of other species in SE Rajasthan, whereas in NE Rajasthan, dung was of no use probably due to less quantity of dung from their limited

number of donkeys. In veterinary practices use of disinfectants is recommended as these play significant role in controlling different infections and infectious agents for good health of the animals but in both the regions 'No bedding and disinfectant' was used.

Health management: Regularly grooming of donkeys, at least once a day, was reported by most of the owners. Although hoofs cleaning were reported by the donkey owners but shoeing and trimming of hoof as well as hair clipping were not common practices in both the regions. Regular trimming of hoof to keep in shape is a must which is lacking in both the regions. There is a need to vaccinate the equines as prophylactic measures. But, vaccination was not in practice in any of the part in Rajasthan as none of the equine owners ever vaccinated their donkeys. Vaccination, insurance and use of disinfectants were not adopted by any of the respondent in the study indicating the least awareness among the donkey owners about the importance of vaccination, insurance and disinfectants. Insurance of livestock including horses is must to protect the horse owners against livestock losses but donkey keepers were least bothered about the insurance of donkeys being the low cost animal. Similar observations were also reported from other states including Haryana, Uttar Pradesh and Uttarakhand (Pal and Legha 2008).

Sometimes, the owners put the donkey on work even if it is wounded. In such situations, donkey must be put out of work till it recovers. Physical cruelty, wounds and low-quality feeding material are the common problems of the donkey. It is time to help the donkey by mobilizing donkey owners to give proper attention and care to this neglected animal.

Only 20% (13/66) of donkey owners were practising deworming occasionally by locally made *masalas* or using therapeutic medicines in SE Rajasthan, but in NE Rajasthan, deworming was being done as curative measure. Pal *et al.* (2011) also reported that deworming of horses was being done as curative measures in Spiti valley, whereas deworming of equines was a common practice among the equine owners of Haryana, Uttar Pradesh and Uttarakhand (Pal and Legha 2008). About 60% of the donkey owners were treating their donkeys using indigenous technical knowhow (ITK). No navel treatment after foaling was done by most of the respondents. Importance of equine health is well understood by the equine owners, but the facilities they avail are mainly curative rather than preventive. The sick equines are taken to veterinary hospital for treatment. Majority of respondents were availing veterinary facility extended by State Govt or NGO and seemed to be well satisfied with the services of provided by both the organizations. In similar type of study, Pal *et al.* (2011) also reported that horse owners of Spiti valley were well satisfied with the services of veterinary hospital and the free supply of veterinary medicines they received for their horses.

Colostrum provide passive immunity against various diseases during neonatal period. Most of the equine owners

(51.5% of SE Rajasthan and 54% of NE Rajasthan) feed the colostrum to the foal within 1h of foaling whereas rest of the owners provided colostrum to the foals after 2 h. Average age of foal at weaning was 5 months (range 4–6 months).

Socio-economic status: Donkeys are used equally by rural and urban carters, nomads and pastoral people in Rajasthan. In SE Rajasthan, out of 66 donkey owners interviewed, 98% were OBC (*kumhars*) and rests were of minority community indicating that a few people of minorities were involved in this enterprise while in NE Rajasthan, 52% donkey owners belonged to minority community. Singh *et al.* (2007) reported that donkeys were mainly (91%) reared by poor and socially low caste households. Average age of donkey owners was 40.36 ± 1.60 years (range 18–67) and 38.7 ± 1.55 years (range 18–65) in SE and NE Rajasthan, respectively; indicating people of middle age group took keen interest in owning donkeys. Literacy (%) among the donkey owners was 41 and 16%, in SE and NE Rajasthan, respectively; indicating low literacy among the SC and minority class. Mean family size was 6.56 ± 0.33 (range 2 to 19) and 4.82 ± 0.28 (range 1–10) in SE and NE Rajasthan, respectively. Majority of donkey owners (77% in SE Rajasthan and 80% in NE Rajasthan) were landless and remaining were having average land holding as 4.93 ± 0.82 (range 1–10) and 1.28 ± 0.6 bigha (range 2–20) in SE and NE Rajasthan, respectively, indicating farming was not a major source of their livelihood. Only 51.51% of donkey owners of SE Rajasthan were maintaining other livestock, viz. cow, goat, buffalo, mule etc. along with the donkeys. In NE Rajasthan, 62% of donkey owners were maintaining only goat as other livestock along with the donkeys. Goat was being maintained to meet out the milk demand of the family as well as it could be maintained on least input. Majority of horse owners of Rajasthan generally maintain other livestock, but this trend was not seen in donkey owners may be due to scarcity of feed and fodder and other resources with the donkey owners. Also majority of donkey owners are landless, which may be another reason of maintaining less number of other livestock by the donkey owners.

Economic importance: Out of the total respondents, 44% in SE Rajasthan and 38% in NE Rajasthan were taking work from their donkeys for 5–6 h and 56% in SE Rajasthan and 62% in NE Rajasthan for 7–8 h. Average rest of 92.73 ± 13.37 min (range 30–120) and 93.6 ± 4.51 min (range 30–120) was given in between work to the donkeys in SE and NE Rajasthan, respectively. Non-working days were observed as 6.03 ± 0.25 days (range 3–12) and 6.96 ± 0.36 days (range 4–16)/month, in SE and NE Rajasthan, respectively. Higher number of non-working days indicates more number of non-income days for the donkey keepers. Increase in these days was mostly due to the religious beliefs of the owners when they do not go for work and this ultimately affects their income. The donkey works hard for a long time but its role is not appreciated. Average income per donkey per day of

donkey owners was Rs 75.0±1.89 and Rs 187.2 ±7.74 in SE and NE Rajasthan, respectively. Average income per donkey per day in NE Rajasthan was high may be due to use of donkey in carting to carry more goods in small duration of time. But, overall income from donkeys per household and their economic status was higher in SE Rajasthan than NE Rajasthan. In another study, donkey owner earned Rs 100 to 250 per day with cart including his own salary. Slightly low (Rs 100 to 200) earning was observed at brick kiln and construction sites (Singh *et al.* 2007). The study indicated that donkeys contribute to sustainable rural development in Rajasthan.

Performance under field conditions: Information on body weights and reproductive performance was generated by interviewing the farmers. The birth weight ranged from 15 to 20 kg and adult weight from 100 to 125 kg. The average age at puberty in males was 42 months and in females 30 to 36 months. The average age at first fertile service, gestation period and foaling interval was 3 years, 365 days and 1.5 years, respectively. The donkey mares exhibited heat 10 to 15 days after foaling. The breeding season is from February to July. The total life span of the donkeys was reported as 20–25 years. The donkey mares had on an average 8–10 foaling during their lifetime. Majority of the respondents were not aware about the symptoms of estrus jenny and their jennies were getting pregnant through the natural covering during grazing.

Although, the technique of semen freezing for equines under laboratory and field conditions has been standardized (Arangasamy *et al.* 2008, Pal *et al.* 2009, Pal *et al.* 2011, Legha and Pal 2012) but extension efforts need to be strengthened as to make equine owners aware about the merits of use of AI in equines and Animal Husbandry Department of State Government should also take initiative for AI in equines by getting their veterinarians trained through National Research Centre on Equines, Hisar. The technique could be utilized for providing the superior quality frozen semen to the equine owners and it will also help in up-gradation and conservation of the equines.

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